WE CLAIM:

1. A method for designing anti-tumor compositions, comprising:

(a) using molecular modeling software on a computer to create a plot of an active conformation of a known anti-tumor composition, said active conformation representative of a three-dimensional conformation of said known anti-tumor composition interacting with a target biological site, said plot providing a first digital representation of said active conformation, said first digital representation depicting a plurality of binding sites of said known anti-tumor composition;

(b) using said software to eliminate portions of said first digital representation while preserving the depiction of said binding sites;

(c) using said software to build a second digital representation of a created composition, said created composition having a three-dimensional conformation and binding sites similar to said known anti-tumor composition.

2. The method of Claim 1, wherein said known anti-tumor composition has a structure including a central skeleton which is depicted in said plot, and wherein said software is utilized to eliminate said central skeleton from said depiction and to substitute therefore a second central skeleton having desired characteristics.

3. The method of Claim 1, wherein said known anti-tumor composition has a structure including a central skeleton and one or more original side chains which are depicted in said plot, and wherein said software is utilized to eliminate one or more original side chains from said depiction and optionally to substitute a created side chain for one or more of said original side chains.

4. The method of Claim 3, further comprising using said software to eliminate said central skeleton from said depiction and to substitute therefore a second central skeleton having desired characteristics.

5. The method of Claims 1,2, 3 or 4 wherein a calculation is performed to determine a binding energy for said created composition, and wherein said created composition is further modified to improve putative binding characteristics, wherein an improved binding characteristic is characterized by a higher binding energy.

Sub A1

6. The method of Claims 1, 2, 3, 4, or 5 wherein said known anti-tumor composition is paclitaxel.

7. A method for designing a paclitaxel alternative composition, which alternative composition has a central skeleton structure composed of single or multiple ring groups which hold multiple functional groups in a fairly rigid alignment, said central skeleton structure having first, second, and third side chains;

wherein said first side chain is connected to said central skeleton with a carbonyl group at a distance of about 1.5 to 5.5 Angstroms from said central skeleton;

wherein said second side chain places an sp^3 oxygen atom at a distance of about 4.5 to 7.5 Angstroms from the skeleton and about 9 to 11 Angstroms from the carbonyl oxygen of said first side chain;

wherein said third side chain is placed in an energetically accessible conformation that places an aromatic ring in a location that is simultaneously about 4 to 6 Angstroms from a substitute for hexene and about 8 to 10 Angstroms from the oxygen in said second side chain, said third side chain selected to mimic the steric and binding properties of the C2 ester in paclitaxel;

said method comprising using molecular modeling software on a computer to design said alternative composition.

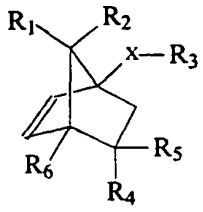
8. The method of Claim 7, wherein said alternative composition further comprises one or more bulking groups and wherein said bulking groups increase the size of said composition to mimic the overall size and shape of the paclitaxel molecule.

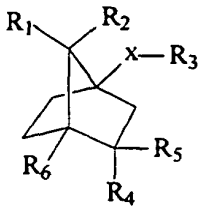
9. The method of Claim 7, wherein said first side chain is selected and positioned to mimic the isoserine group in taxane.

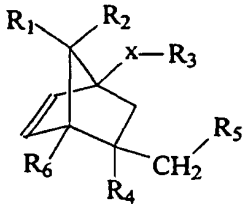
10. The method of Claim 7, wherein said sp^3 oxygen is positioned in space to simulate the position of the oxetane ring of paclitaxel.

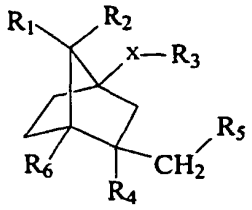
11. The method of Claims 7-11 further comprising synthesizing said alternative composition.

12. A paclitaxel compound having a chemical structure selected from one of the following norbonyls





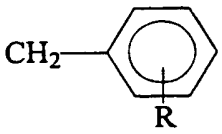


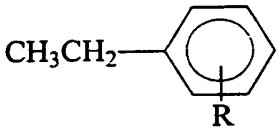


wherein R_1 or R_2 or both R_1 and R_2 are hydrogen, methyl, acetyl, ethyl, short aliphatic chain (C_1 - C_4), or substituted aliphatic chain (C_1 - C_6) where substitution includes in one or two of the R_1 organic functional groups such as an amide; ketone; hydroxy; phenyl; carboxylic acid; an amino acid, for example, asparagine, glutamine, aspartic acid, glutamic acid, threonine, serine or tyrosine. Preferable chemical structures are obtained with the following:

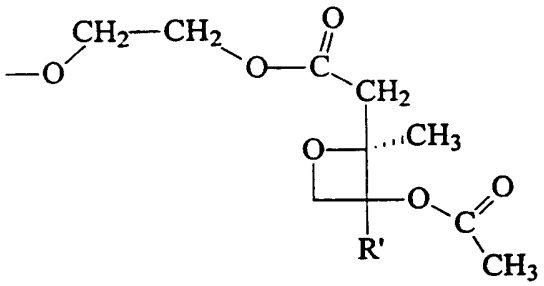
R_1 = H or CH_3;

R_2 = CH_3; CH_2OCOCH_3; or





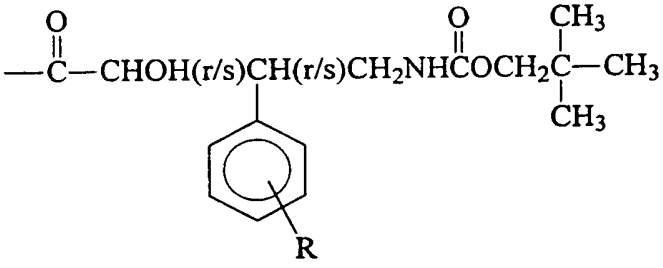
wherein R is H or singly, doubly, or triply substituted or fused; or

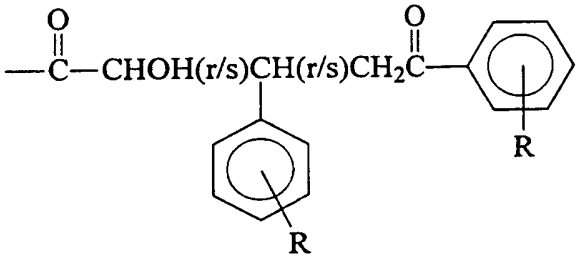


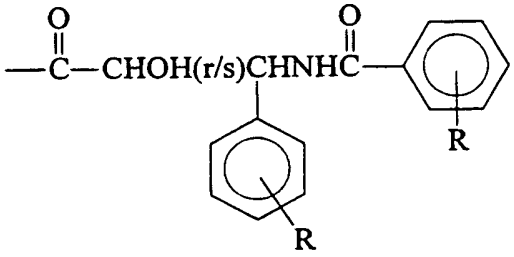
wherein R' is H or CH_3;

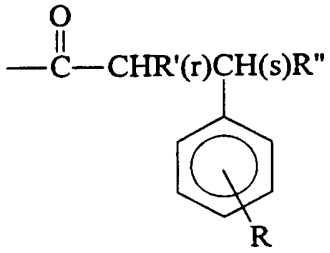
wherein X = O; CH_2; NH; S; S-CH_2; O-CH_2 or none;

wherein R_3 is one of the following:

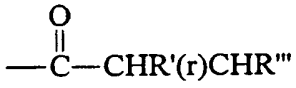




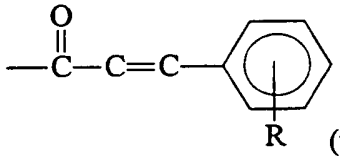




wherein R' = OH when R" = NHBOC; R' = H when R" = NHBOC; R' = OH when R" = H; R' = H when R" = H (These substituents are still active in paclitaxel per Guenard, et al. 1993. "Structure-activity relationships of taxol and taxotere analogues," *J Natl Cancer Inst Monogr* 15:79-82.);



wherein R' is as given above and R'" can also be substituted aryl (single or double) or fused aromatic ring as in tryptophan or imidazol ring, or substituted tryptophan; preferably, the aromatic ring can be substituted with carboxylic acid derivatives;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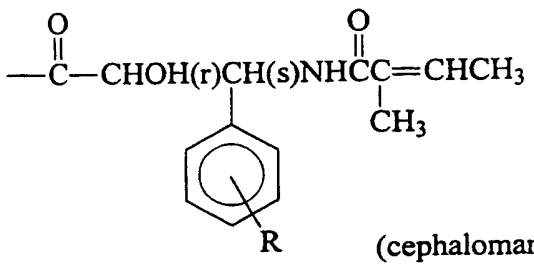
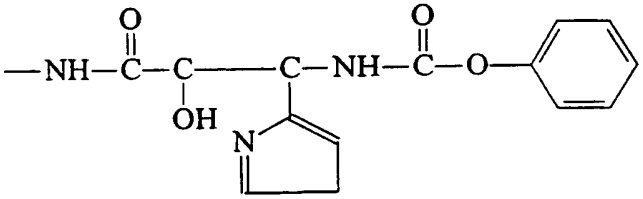
or



(cephalomannine)

or



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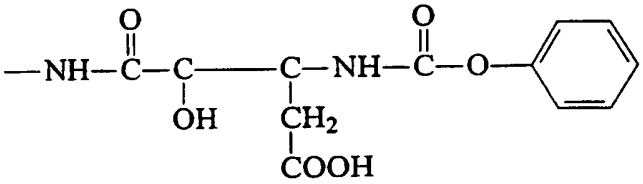

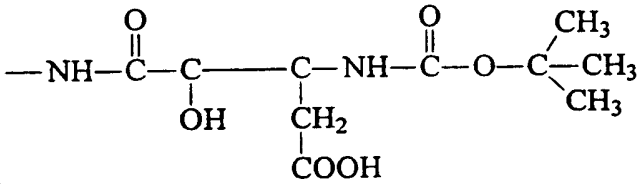

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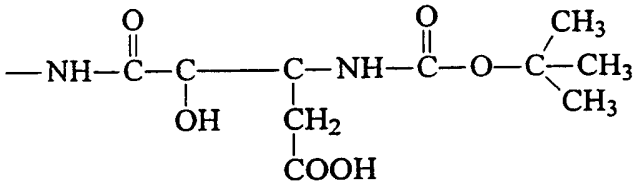

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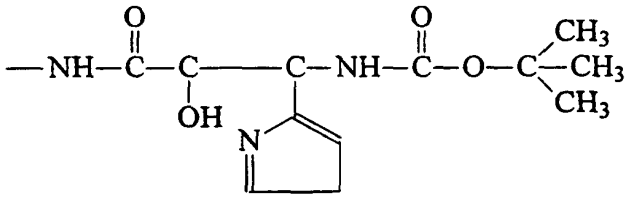
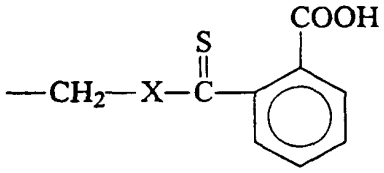
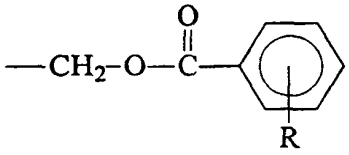
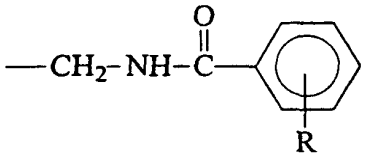


For the aryl groups in R_3, R can be H or singly, doubly, or triply substituted OH or preferably with electron withdrawing substituents such as fluoro (F^-) or trifluoromethyl (CF_3^-). R_3 can also be any group derived from the 13 position in taxane's skeleton that exhibits activity toward inhibiting the depolymerization of microtubules and/or anticancer activity;

wherein R_4 is one of the following:

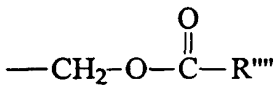




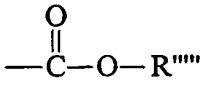


when the aromatic ring is singly, doubly, or triply substituted;

or



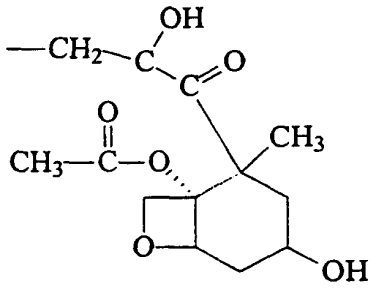
where R"" is a fixed aromatic ring or substituted fused aromatic ring; or



wherein R"" can be H or a short nonsubstituted or substituted hydrocarbon chain C_n wherein n = 1-3 or cyclopropane;

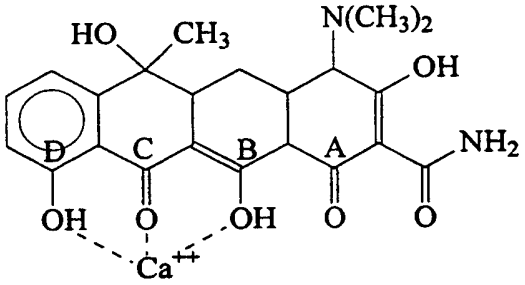
One or more subsititution can be made on the aromatic ring of R_4. Preferably, the substituent(s) on the substituted aromatic ring is an electron withdrawing substituent. Examples include fluoro- and chloro-substitution, but any electron-withdrawing substituent compatible with the system may be used which provides a lower energy gap in a π - π interaction between the composition and aromatic amino acids of proteins;

wherein R_5 is one of the following:



or H; or CH_3; or small nonsubstituted or substituted hydrocarbon C_n where n = 1-5; or small nonsubstituted or substituted hydrocarbon ring or heterocyclic ring; or citric acid and derivatives thereof; or acetic acid and derivatives thereof; or ascorbic acid and derivatives thereof; or glucouroic acid or derivatives thereof; or lactose, sialic acid, or monosaccharides or disaccharides

of glyceraldehyde, erythrose, threose, ribose, arabinose xylose lyxose, allose, altrose, glucose, mannose, gulose, idose, galactose, talose, or their acidic ketose, alditol or inositol forms; or calcium chelating molecule or oxygenated small molecule, i.e., small carboxylic acids; or a dipeptide such as "ASP-ASN" or "GLY-GLN", a cyclic dipeptide such as "PHE-GLN", or small organic molecules that mimic the functional properties of these peptides; or any organic molecule that exhibits calcium-binding properties similar to tetracyclin as given below



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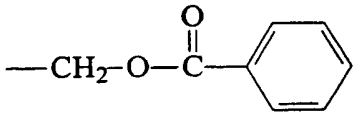

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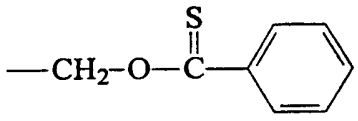

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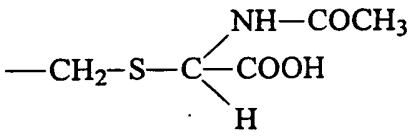

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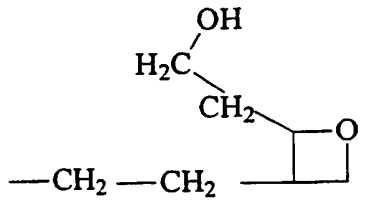

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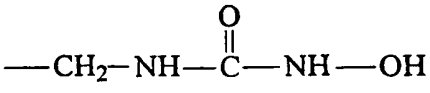

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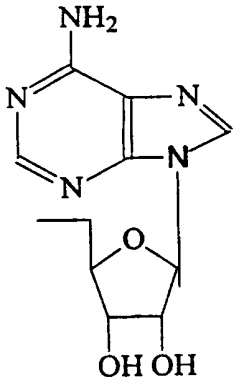

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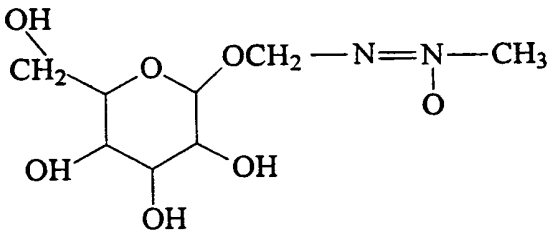

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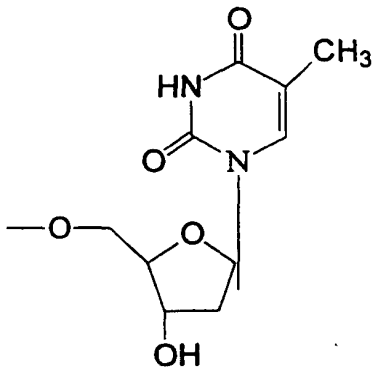
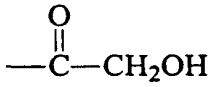
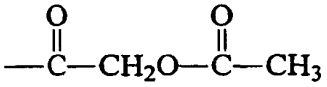
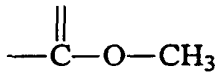


or in some cases can also be any of the R_4 groups;

wherein R_6 and/or R_6' , which can be the same or different, is one of the following:

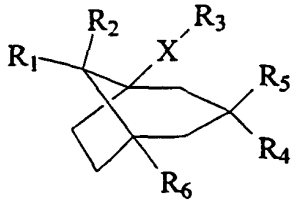






or H; or CH_3; or OH; or amine or short carbo-aliphatic chain, substituted with two or three of the following: keto, hydroxy, sulfoxy, amide, or an amino acid residue such as serine, asparagine, or threonine; or ethers of the form $-CH_2-O-(CH_2)_n-CH_3$ where n=1-5 and the right hand hydrocarbon chain may be substituted with up to five -OH or carbonyl groups;

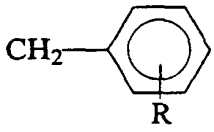
13. A paclitaxel compound having the following bicyclo-octane chemical structure

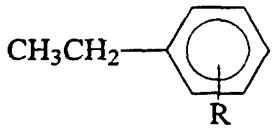


wherein R_1 or R_2 or both R_1 and R_2 are hydrogen, methyl, acetyl, ethyl, short aliphatic chain (C_1 - C_4), or substituted aliphatic chain (C_1 - C_6) where substitution includes in one or two of the R_1 organic functional groups such as an amide; ketone; hydroxy; phenyl; carboxylic acid; an amino acid, for example, asparagine, glutamine, aspartic acid, glutamic acid, threonine, serine or tyrosine. Preferable chemical structures are obtained with the following:

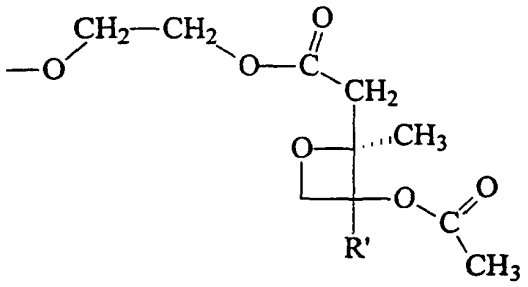
R_1 = H or CH_3;

R_2 = CH_3; CH_2OCOCH_3; or





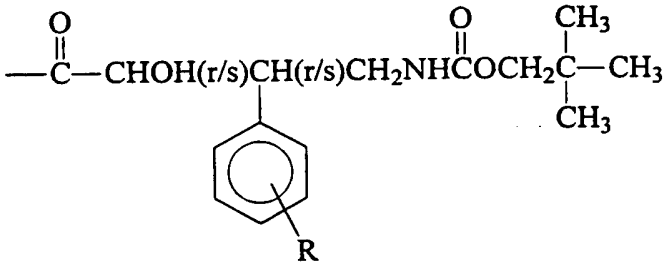
wherein R is H or singly, doubly, or triply substituted or fused; or

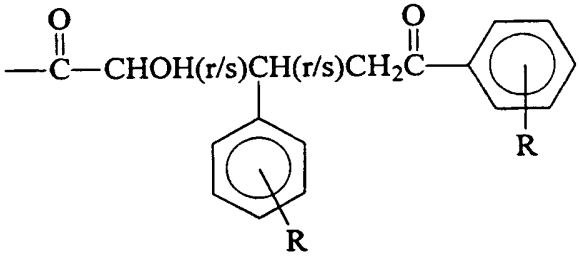


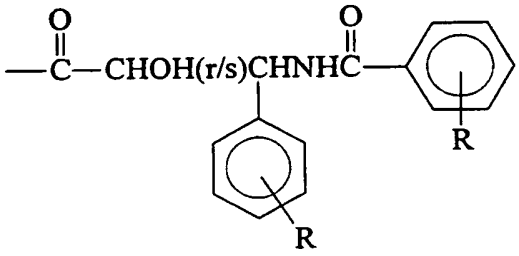
wherein R' is H or CH_3;

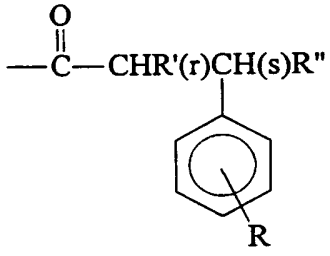
wherein X = O; CH_2; NH; S; S-CH_2; O-CH_2 or none;

wherein R_3 is one of the following:



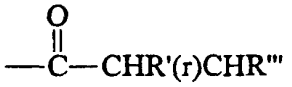




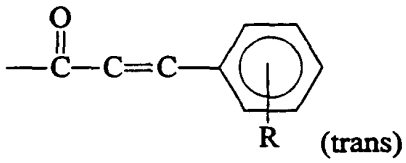


wherein R' = OH when R" = NHBOC; R' = H when R" = NHBOC; R' = OH when R" = H; R' = H when R" = H

(These substituents are still active in paclitaxel per Guenard, et al. 1993. "Structure-activity relationships of taxol and taxotere analogues," *J Natl Cancer Inst Monogr* 15:79-82.);

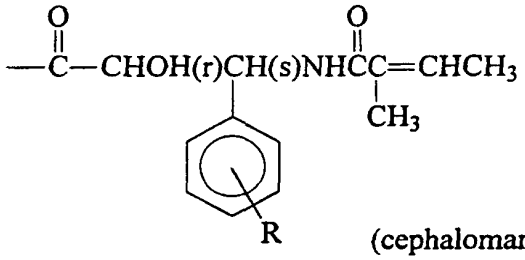


wherein R' is as given above and R''' can also be substituted aryl (single or double) or fused aromatic ring as in tryptophan or imidazol ring, or substituted tryptophan; preferably, the aromatic ring can be substituted with carboxylic acid derivatives;



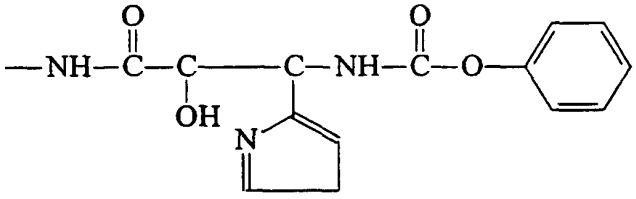
(trans)

or



(cephalomannine)

or



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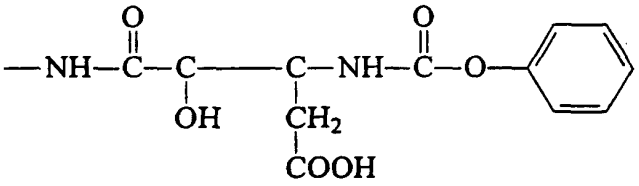

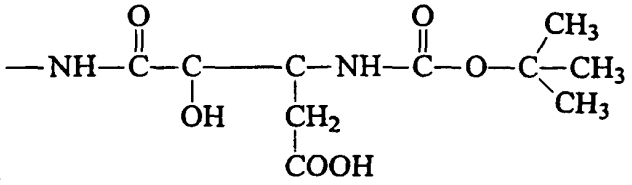

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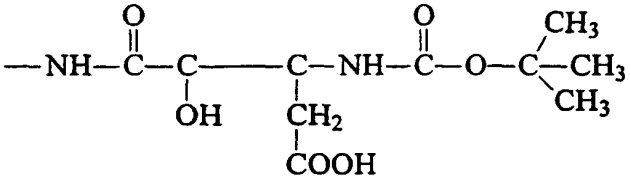

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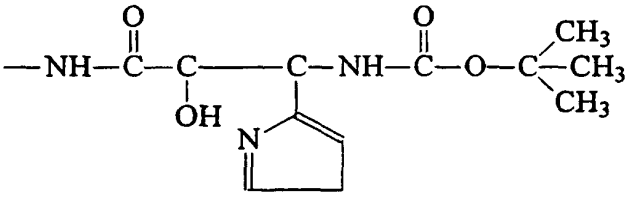
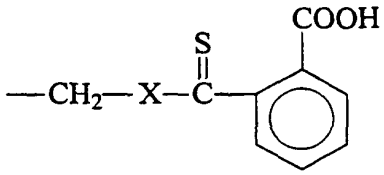
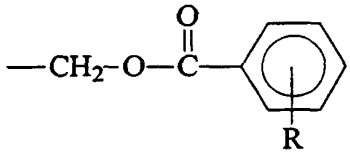
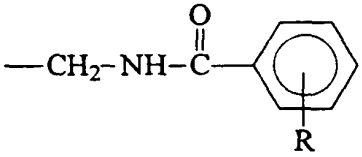


For the aryl groups in R_3, R can be H or singly, doubly, or triply substituted OH or preferably with electron withdrawing substituents such as fluoro (F^-) or trifluoromethyl (CF_3^-). R_3 can also be any group derived from the 13 position in taxane's skeleton that exhibits activity toward inhibiting the depolymerization of microtubules and/or anticancer activity;

wherein R_4 is one of the following:

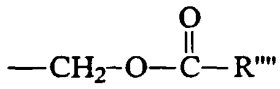




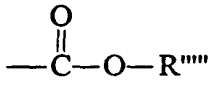


when the aromatic ring is singly, doubly, or triply substituted;

or



where R"" is a fixed aromatic ring or substituted fused aromatic ring; or

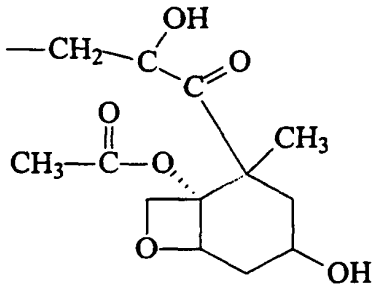


wherein R"" can be H or a short nonsubstituted or substituted hydrocarbon chain C_n wherein n = 1-3 or cyclopropane;

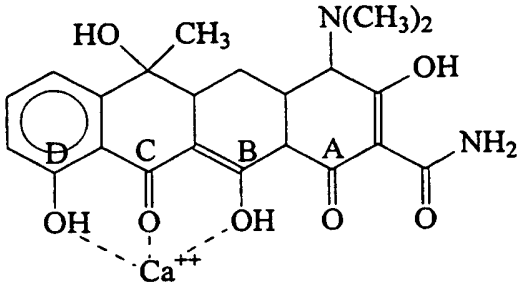
One or more subsititution can be made on the aromatic ring of R_4. Preferably, the substituent(s) on the substituted aromatic ring is an electron withdrawing substituent. Examples include fluoro- and chloro-substitution, but any electron-withdrawing substituent

compatible with the system may be used which provides a lower energy gap in a π - π interaction between the composition and aromatic amino acids of proteins;

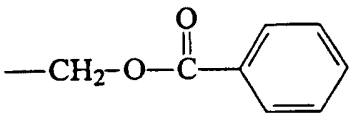
wherein R_5 is one of the following:



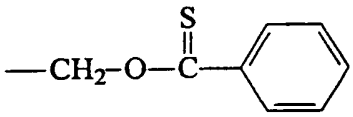
or H; or CH_3; or small nonsubstituted or substituted hydrocarbon C_n where n = 1-5; or small nonsubstituted or substituted hydrocarbon ring or heterocyclic ring; or citric acid and derivatives thereof; or acetic acid and derivatives thereof; or ascorbic acid and derivatives thereof; or glucouroic acid or derivatives thereof; or lactose, sialic acid, or monosaccharides or disaccharides of glyceraldehyde, erythrose, threose, ribose, arabinose xylose lyxose, allose, altrose, glucose, mannose, gulose, idose, galactose, talose, or their acidic ketose, alditol or inositol forms; or calcium chelating molecule or oxygenated small molecule, i.e., small carboxylic acids; or a dipeptide such as "ASP-ASN" or "GLY-GLN", a cyclic dipeptide such as "PHE-GLN", or small organic molecules that mimic the functional properties of these peptides; or any organic molecule that exhibits calcium-binding properties similar to tetracyclin as given below



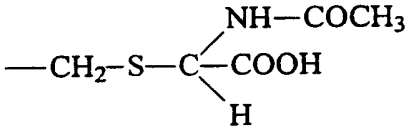
or



or



or



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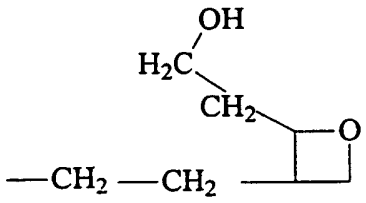

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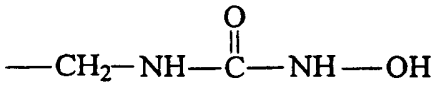

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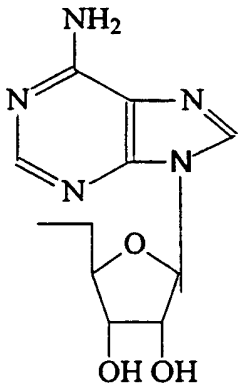

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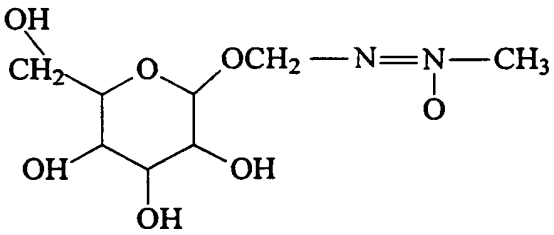

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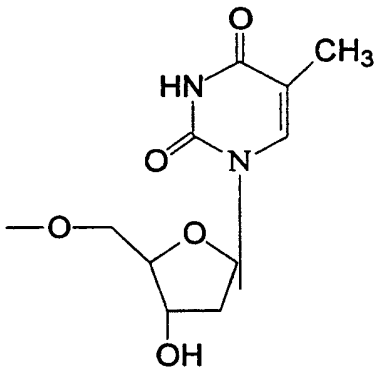
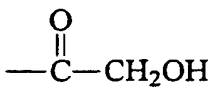
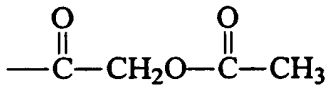
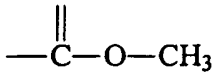


or in some cases can also be any of the R_4 groups;

wherein R_6 and/or R_6' , which can be the same or different, is one of the following:







or H; or CH_3; or OH; or amine or short carbo-aliphatic chain, substituted with two or three of the following: keto, hydroxy, sulfoxy, amide, or an amino acid residue such as serine, asparagine, or threonine; or ethers of the form $-CH_2-O-(CH_2)_n-CH_3$ where n=1-5 and the right hand hydrocarbon chain may be substituted with up to five -OH or carbonyl groups;

ADD A3